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DIALOG(R)File 351:Derwent WPI

009429293 **Image available**
WPI Acc No: 1993-122809/199315
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Automatic semiconductor device production equipment - has communication channel used for wafer transfer between preceding and following devices, which sends information for processing conditions in addition to transfer control signal. NoAbstract

Patent Assignee: CANON KK (CANO)
Number of Countries: 001 Number of Patents: 001
Patent Family:

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Priority Applications (No Type Date): JP 91248519 A 19910903
Patent Details:

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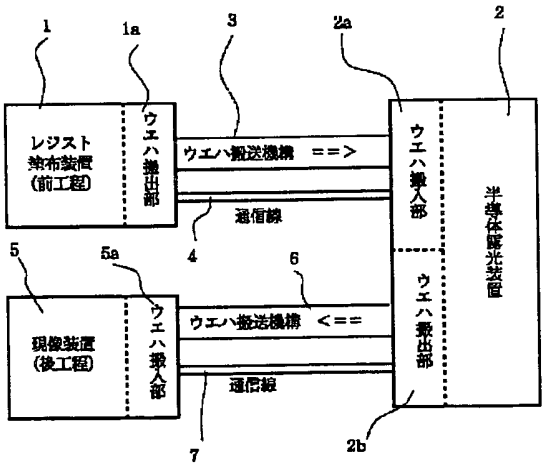
(54)【発明の名称】　半導体製造装置

(57)【要約】

【目的】　露光工程の前後処理装置間において、ウエハ授受の通信とウエハ処理条件データの通信とを同一系統の通信回線で行い、通信効率を向上させ装置スループットの増大を図る。

【構成】　半導体露光装置２と露光前工程処理および露光後工程処理装置１、５とをそれぞれウエハ搬送機構３、６を介して連結し、前記半導体露光装置２と前記露光前および露光後工程処理装置１、５の各々とを動作制御用通信回線４、７で接続した半導体製造装置において、前記通信回線４、７は、ウエハ受け渡しの制御信号およびウエハ処理条件情報信号を同時に通信可能とした。



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【特許請求の範囲】

【請求項1】　半導体露光装置と露光前工程処理装置および露光後工程処理装置とをそれぞれウエハ搬送機構を介して連結し、前記半導体露光装置と前記露光前および露光後工程処理装置の各々とを動作制御用通信回線で接続した半導体製造装置において、前記通信回線は、ウエハ受け渡しの制御信号およびウエハ処理条件情報信号を同時に通信可能であることを特徴とする半導体製造装置。

【請求項2】　前記通信回線は、露光前工程処理装置から露光装置に対し露光条件情報を通信可能であることを特徴とする請求項1の半導体製造装置。

【請求項3】　前記通信回線は、露光装置から露光後工程処理装置に対し露光処理結果情報を通信可能であることを特徴とする請求項1の半導体製造装置。

【請求項4】　前記露光前工程および後工程処理装置はそれぞれレジスト塗布装置および現像装置であることを特徴とする請求項1の半導体製造装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は半導体製造装置に関し、特に、前・後工程処理装置と直接結合してウエハの授受を行い、処理の自動化を行わせる半導体製造装置に関するものである。

【0002】

【従来の技術】従来の半導体製造装置において、露光装置とその前・後工程処理装置（レジスト塗布装置・現像装置）とを直接結合（インライン）して、ウエハの受け渡しを行う場合、装置双方間を通信回線で結び、ウエハ授受のための制御信号のみの通信を行っていた。また、装置全体の自動化を行う際、そのウエハを処理する上で必要な条件（マスク、露光量等のパラメータ）は上記通信回線とは別に設けた通信回線を用いて、この通信回線に接続されたホストコンピュータ等と通信してデータを得る事により、自動化を実現していた。

【0003】

【発明が解決しようとする課題】しかしながら、上記従来例ではウエハ授受の通信回線とは別の通信回線を設けて処理条件の情報を取得していたため、次のような欠点があった。

【0004】（1）処理条件の情報を取得するための通信回線を別に容易しなければならない。このため配線等が複雑となり、また配線作業も面倒になる。

【0005】（2）ウエハ（ウエハ授受）とその処理条件情報との流れが別系統（別通信）になっているため、管理および、制御が複雑になる。

【0006】（3）枚葉処理（ウエハ一枚毎に処理条件が異る）の場合ウエハ一枚毎に通信を行うため、通信回数が増大し、効率が悪く、装置スループットが低下する。

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【0007】本発明は上記従来技術の欠点に鑑みなされたものであって、露光工程の前後処理装置間において、ウエハ授受の通信とウエハ処理条件データの通信とを同一系統の通信回線で行い、通信効率を向上させ装置スループットの増大を図った半導体製造装置の提供を目的とする。

【0008】

【課題を解決するための手段および作用】前記目的を達成するため、本発明によれば、前・後工程装置間でのウエハ受け渡しのための通信回線は、ウエハ受け渡し制御信号だけでなく、処理条件の情報をも同時に通信可能とする。これによりホストコンピュータ等とのデータ交換用通信回線を別に用いることなく、半導体露光装置の処理条件を切り換えることが可能になる。

【0009】

【実施例】図1は、本発明が実施される半導体露光装置を取り巻く自動化ラインの実施例を示すブロック図である。

【0010】図1に於いて、1は半導体露光の前工程装置として、ウエハに感光剤を塗布するレジスト塗布装置であり、1aは半導体露光装置にウエハを搬出するウエハ搬出部である。2は本発明に係わる半導体露光装置であり、マスク上のパターンをレジストが塗布されたウエハ上に転写する。2aはレジスト塗布装置1からのウエハを露光装置2内に搬入するウエハ搬入部である。3はレジスト塗布装置1の搬出部1aから送り出されたウエハを半導体露光装置2の搬入部2aに送り込むウエハ搬送機構である。

【0011】4はRS232C等の規格の通信線であり、ウエハ搬送機構3に送り出されるウエハの装置間授受の制御信号のやりとりを行うと同時に、半導体露光装置2にそのウエハの処理条件の情報を送り込む。2bは露光したウエハを現像装置に搬出するウエハ搬出部である。

【0012】5は半導体露光の後工程装置としての現像装置であり、5aはウエハ搬入部である。6は半導体露光装置2のウエハ搬出部2bから送り出されたウエハを現像装置の5のウエハ搬入部5aに送り込むウエハ搬送機構である。7は前記通信線4と同様の通信線である。ここではこの通信線7はウエハの露光結果の情報をもあわせて通信する。

【0013】図2は本発明に特に係わるデータ内容の例を示す。ここで40は、レジスト塗布装置1のウエハ搬出部1aから半導体露光装置2のウエハ搬入部2aにウエハが引き渡される時、その制御信号と同時に送られる情報の内容である。この情報は半導体露光装置2に対する処理条件を指示するものである。

【0014】40－1は半導体露光装置にウエハを搬送開始したことを知らせると同時に、そのウエハ処理条件の情報であることを識別させるための識別制御コードで

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ある。４０－２は引き渡された当該ウエハを露光するのに使用する使用マスク名であり、半導体露光装置に予め複数のマスクが収容されていてその内から選択指示するためのものである。４０－４は引き渡された当該ウエハを露光するための露光時間である。４０－３は引き渡された当該ウエハを露光するために使用されるその他のパラメータ群を保持しているパラメータ・ファイルを指定する露光ジョブ名であり、半導体露光装置に内蔵されている磁気デイスク等に予め設定登録されている複数の露光ジョブ・ファイルから選択指示するためのものである。

【００１５】図３はレジスト塗布装置１から半導体露光装置２にウエハが搬送される時の双方間の動作およびその後の半導体露光装置２の動作を示したフローチャートである。

【００１６】以下、図１、図２および図３を参照して本実施例の動作を説明する。

【００１７】図３のフローチャートの左側（ステップＳ１からＳ６）は前工程装置であるレジスト塗布装置側の処理シーケンスである。一方右側（ステップＳ１０からＳ１９）は半導体露光装置側の処理シーケンスである。この両方の処理シーケンスがお互いに同期を取り通信しながら並行してシーケンスを遂行していくものである。

【００１８】先ず前工程装置であるレジスト塗布装置１のスタート操作を待つ（ステップＳ１）。スタート操作が行われるとレジスト塗布装置１は、半導体露光装置２側からのウエハ搬入要求の受信待ちになる（ステップＳ２）。ここで半導体露光装置２のスタート操作の待ち状態（ステップＳ１０）からスタート操作が行われるとレジスト塗布装置１に対してウエハ搬入要求（ウエハを貰いたい）の送信をする（ステップＳ１１）。

【００１９】この通信を待っていたレジスト塗布装置１はステップＳ２の待ちループを抜け次のステップに進み、これから搬出するウエハの露光のための処理条件の情報４０を半導体露光装置２に送信し（ステップＳ３）、その後ウエハ搬送機構３を作動させてウエハ搬送を開始させる（ステップＳ４）。

【００２０】一方、半導体露光装置２はステップＳ１１後、ステップＳ３の露光のための処理条件の情報４０の受信により待ちのループ（ステップＳ１２）を抜け、搬送されてきつつあるウエハを受領すべくウエハ搬入部２ａの動作を開始し（ステップＳ１３）、受領完了する迄の待ちループに入る（ステップＳ１４）。受領が完了するとステップＳ１４を抜けウエハ搬入部２ａの動作を停止させる（ステップ１５）。受領が完了したのでレジスト塗布装置１に対してウエハ搬入完了（受領完了）の送信を行う（ステップＳ１６）。これにより、この通信の受信待ちの状態（ステップＳ５）にあったレジスト塗布装置１はこのステップＳ５を抜けウエハ搬送機構３の動作を停止させ（ステップＳ６）、これにより一枚のウエハ搬出を完了する。その後、次のウエハ搬出のためにステップＳ２のループに戻る。

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【００２１】一方、半導体露光装置２はステップＳ１６迄で一枚のウエハ受領を完了し、露光のための処理を開始する。

【００２２】先ず、装置内に予め収容されている複数のマスクの中から、ステップＳ１２で受信した当該ウエハの露光のための処理条件の情報４０中の使用マスク名４０－２で指定されたマスクを自動的にセットする（ステップＳ１７）。

【００２３】同様に、装置に内蔵されている磁気デイスク等に予め設定登録されている複数の露光ジョブ・ファイルの中から、４０－３で指定された露光ジョブ名の露光ジョブ・ファイルのパラメータ群を読み込み、次に４０－４で指定された露光時間分の露光を行う（ステップＳ１８）。

【００２４】露光を完了したウエハは、後工程装置である現像装置５に搬出される（ステップＳ１９）。以上でレジスト塗布装置１から受領した一枚のウエハに対する半導体露光装置２内での処理を全て完了し、次のウエハを受領すべくステップＳ１１へ戻る。以上説明してきた処理ループ（ステップＳ２からＳ６およびステップＳ１１からＳ１９）を繰り返すことにより、連続して複数のウエハに対して露光処理を行う。

【００２５】なお、上記実施例において、通信線は電気的通信の場合で説明したが、光学的通信であってもよい。また、上記実施例では、前工程装置（レジスト塗布装置）から半導体露光装置に対し、処理条件を切り換える場合で説明したが、半導体露光装置の処理結果を後工程処理装置（現像装置）に通信することであってもよい。また、前・後工程装置の両方が一体化され、通信回線も単回線を共用する方法になってもよい。

【００２６】

【発明の効果】以上説明したように、ウエハ授受のための通信回線に、ウエハ授受の制御信号だけでなく、処理条件の情報を付加することにより、通信回線を別に用意することなく、処理条件を切り換えることが可能になる。

【図面の簡単な説明】

【図１】　本発明が適用される半導体露光装置を取り巻く自動化ラインの実施例を示すブロック図である。

【図２】　本発明に係わる半導体製造装置で用いられる露光条件のデータ内容例である。

【図３】　レジスト塗布装置から半導体露光装置にウエハが搬送される時の双方間の動作およびその後の半導体露光装置の動作を示すフローチャートである。

【符号の説明】

１；レジスト塗布装置、１ａ；レジスト塗布装置のウエハ搬出部、２；半導体露光装置、２ａ；半導体露光装置のウエハ搬入部、２ｂ；半導体露光装置のウエハ搬出

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部、3；ウエハ搬送機構、4；通信線、5；現像装置、5a；現像装置のウエハ搬入部、6；ウエハ搬送機構、7；通信線、40；露光条件のデータ内容、40－1；

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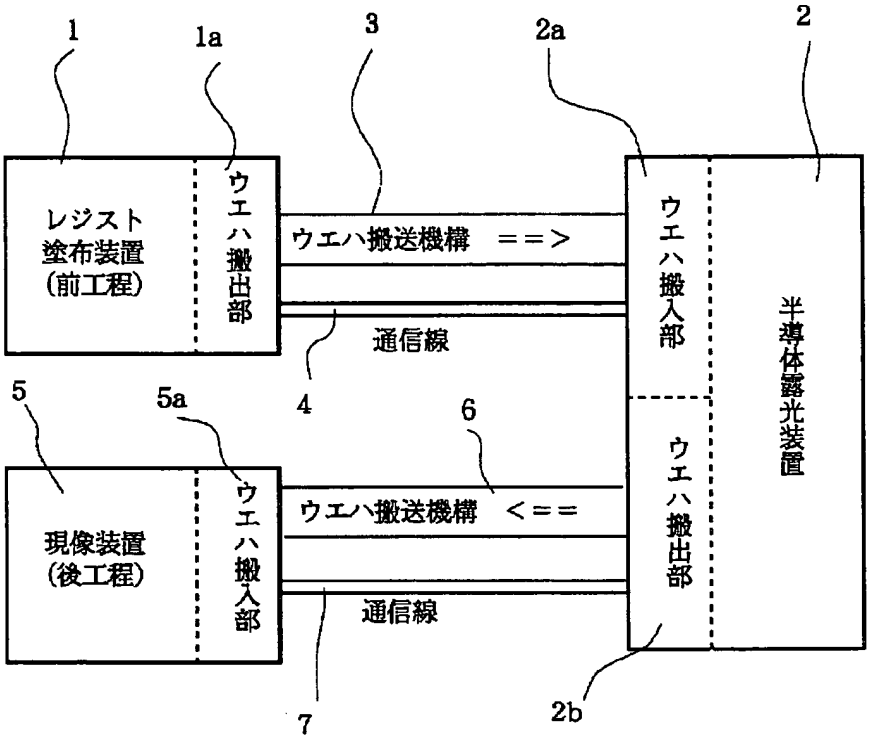
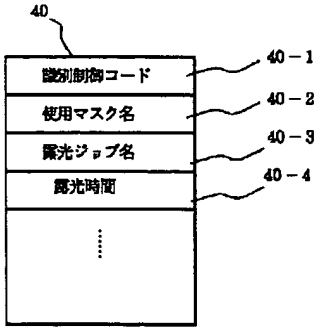
識別制御コード、40－2；使用マスク名、40－3；露光ジョブ名、40－4；露光時間

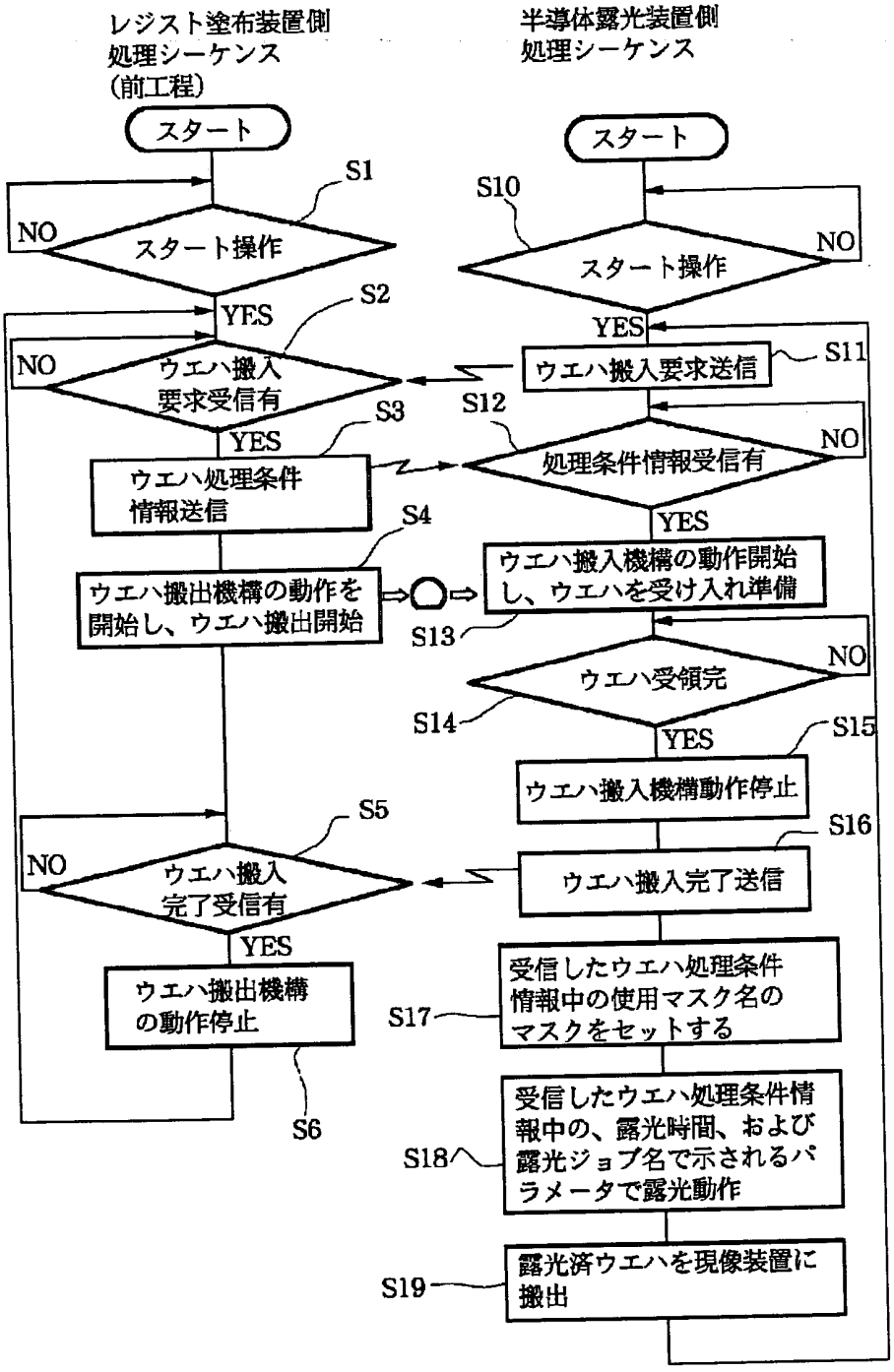
【図1】



【図2】



【図3】


レジスト塗布装置側
処理シーケンス
(前工程)
半導体露光装置側
処理シーケンス
スタート
スタート
S1
S10
NO
スタート操作
スタート操作
NO
YES
YES
S2
NO
ウエハ搬入
要求受信有
ウエハ搬入要求送信
S11
S12
S3
YES
NO
ウエハ処理条件
情報送信
処理条件情報受信有
YES
S4
ウエハ搬出機構の動作を
開始し、ウエハ搬出開始
ウエハ搬入機構の動作開始
し、ウエハを受け入れ準備
S13
NO
ウエハ受領完
S14
YES
S15
ウエハ搬入機構動作停止
S5
S16
NO
ウエハ搬入
完了受信有
ウエハ搬入完了送信
YES
ウエハ搬出機構
の動作停止
受信したウエハ処理条件
情報中の使用マスク名の
マスクをセットする
S17
S6
受信したウエハ処理条件情
報中の、露光時間、および
露光ジョブ名で示されるパ
ラメータで露光動作
S18
露光済ウエハを現像装置に
搬出
S19

CLAIMS

[Claim(s)]
[Claim 1] They are the semiconductor fabrication machines and equipment characterized by the ability of said communication line to communicate the control signal of wafer delivery, and a wafer processing condition information signal to coincidence in the semiconductor fabrication machines and equipment which connected the semi-conductor aligner, the front [exposure] process processor, and the process processor after exposure through the wafer conveyance device, respectively, and connected each of before said semi-conductor aligner and said exposure and the process processor after exposure by the communication line for motion control.
[Claim 2] Said communication lines are the semiconductor fabrication machines and equipment of claim 1 characterized by the ability to communicate exposure condition information from the process processor before exposure to an aligner.
[Claim 3] Said communication lines are the semiconductor fabrication machines and equipment of claim 1 characterized by the ability to communicate exposure processing result information from an aligner to the process processor after exposure.
[Claim 4] A front [said exposure] process and a back process processor are the semiconductor fabrication machines and equipment of claim 1 characterized by being a resist coater and a developer, respectively.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] About semiconductor fabrication machines and equipment, especially this invention is coupled directly with before and an after process processor, delivers and receives a wafer, and relates to the semiconductor fabrication machines and equipment which make processing automate.
[0002]
[Description of the Prior Art] In the conventional semiconductor fabrication machines and equipment, when direct coupling (in-line) of an aligner, and before [the] and an after process processor (a resist coater and developer) was carried out and a wafer was delivered, only the control signal for an epilogue and wafer transfer was communicated by the communication line in between both equipment. Moreover, when automating the whole equipment, conditions (parameters, such as a mask and light exposure) required when processing that wafer had realized automation using the communication line prepared apart from the above-mentioned communication line by communicating with the host computer connected to this communication line, and obtaining data.
[0003]
[Problem(s) to be Solved by the Invention] However, in the above-mentioned conventional example, since the communication line other than the communication line of wafer transfer was prepared and the information on processing conditions was acquired, there were the following faults.
[0004] (1) It must carry out easy [of the communication line for acquiring the information on processing conditions] independently. For this reason, wiring etc. becomes complicated and a wiring activity also becomes troublesome.
[0005] (2) Since the flow of a wafer (wafer transfer) and its processing condition information is another network (another communication link), management and control become complicated.
[0006] (3) When it is sheet processing (processing conditions differ for every one wafer), in order to communicate for every one wafer, the count of a communication link increases, effectiveness is bad and an equipment throughput falls.
[0007] This invention is made in view of the fault of the above-mentioned conventional technique, performs the communication link of wafer transfer, and the communication link of wafer processing condition data by the communication line of the same network between exposure process order processors, and aims at offer of the semiconductor fabrication machines and equipment which communication link effectiveness was raised and aimed at increase of an equipment throughput.
[0008]
[Means for Solving the Problem and its Function] Since said purpose is attained, according to this invention, the communication line for the wafer delivery between before and after process equipment enables the communication link not only of a wafer delivery control signal but the information on processing conditions at coincidence. It becomes possible to switch the processing conditions of a semi-conductor aligner, without this using independently the communication line for the data exchanges with a host computer etc.
[0009]
[Example] Drawing 1 is the block diagram showing the example of automation Rhine which surrounds the semi-conductor aligner with which this invention is carried out.
[0010] In drawing 1 , 1 is a resist coater which applies a sensitization agent to a wafer as last process equipment of semi-conductor exposure, and 1a is the wafer taking-out section which takes out a wafer to a semi-conductor aligner. 2 is a semi-conductor aligner concerning this invention, and is imprinted on the wafer with which the pattern on a mask was applied to the resist. 2a is the wafer carrying-in section which carries in the wafer from the resist coater 1 in an aligner 2. 3 is the wafer conveyance device in which the wafer sent out from taking-out section 1a of the resist coater 1 is sent into carrying-in section 2a of the semi-conductor aligner 2.
[0011] 4 is the communication wire of specification, such as RS232C, and it sends the information on the processing conditions of the wafer into the semi-conductor aligner 2 at the same time it exchanges the control signal of the transfer between equipment of the wafer sent out to the wafer conveyance device 3. 2b is the wafer taking-out section which takes out the exposed wafer to a developer.
[0012] 5 is a developer as after [semi-conductor exposure] process equipment, and 5a is the wafer carrying-in section. 6 is the wafer conveyance device in which the wafer sent out from wafer taking-out section 2b of the semi-conductor aligner 2 is sent into wafer carrying-in section 5a of 5 of a developer. 7 is said communication wire 4 and the same communication wire. Here, this communication wire 7 also unites the information on the exposure result of a wafer, and communicates.

[0013] Especially drawing 2 shows the example of the contents of data concerning this invention. 40 is the contents of the information sent to the control signal and coincidence here, when a wafer is handed over by wafer carrying-in section 2a of the semi-conductor aligner 2 from wafer taking-out section 1a of the resist coater 1. This information directs the processing conditions over the semi-conductor aligner 2.
[0014] 40-1 is a discernment control code for making it identify that it is the information on the wafer processing condition at the same time it tells a semi-conductor aligner about having carried out conveyance initiation of the wafer. 40-2 is a use mask name used for exposing the handed-over wafer concerned, and is for two or more masks being beforehand held in the semi-conductor aligner, and carrying out selection directions from the inside of it. 40-4 is the exposure time for exposing the handed-over wafer concerned. 40-3 is an exposure job name which specifies the parameter file holding the parameter group of others which are used in order to expose the handed-over wafer concerned, and is for carrying out selection directions from two or more exposure job files by which setting registration is carried out beforehand at the magnetic disk built in the semi-conductor aligner.
[0015] Drawing 3 is the flow chart which showed the actuation between both sides in case a wafer is conveyed, and actuation of the subsequent semi-conductor aligner 2 to the semi-conductor aligner 2 from the resist coater 1.
[0016] Hereafter, actuation of this example is explained with reference to drawing 1 , drawing 2 , and drawing 3 .
[0017] The left-hand side (from step S1 to S6) of the flow chart of drawing 3 is a processing sequence by the side of the resist coater which is last process equipment. On the other hand, right-hand side (from step S10 to S19) is a processing sequence by the side of a semi-conductor aligner. While the processing sequence of these both takes a synchronization to each other and communicates to him, the sequence is carried out in parallel.
[0018] It waits for start actuation of the resist coater 1 which is last process equipment first (step S1). If start actuation is performed, the resist coater 1 will become the receiving waiting of the wafer carrying-in demand from the semi-conductor aligner 2 side (step S2). If start actuation is performed here from the waiting state (step S10) of start actuation of the semi-conductor aligner 2, a wafer carrying-in demand (I want to get a wafer) will be transmitted to the resist coater 1 (step S11).
[0019] The resist coater 1 which was waiting for this communication link escapes from the waiting loop formation of step S2, and progresses to the following step, the information 40 on the processing conditions for exposure of the wafer to be taken out from now on is transmitted to the semi-conductor aligner 2 (step S3), the wafer conveyance device 3 is operated after that, and wafer conveyance is made to start (step S4).
[0020] On the other hand, that the semi-conductor aligner 2 should escape from the loop formation (step S12) of waiting after step S11 by reception of the information 40 on the processing conditions for exposure of step S3, and the wafer currently conveyed should be received, actuation of wafer carrying-in section 2a is started (step S13), and a waiting loop formation until it carries out the completion of receipt is entered (step S14). If receipt is completed, it will escape from step S14 and actuation of wafer carrying-in section 2a will be stopped (step 15). Since receipt was completed, the completion of wafer carrying in (the completion of receipt) is transmitted to the resist coater 1 (step S16). The resist coater 1 which suited the condition (step S5) of the waiting for reception of this communication link escapes from this step S5, stops actuation of the wafer conveyance device 3 (step S6), and, thereby, completes one wafer taking out. Then, it returns to the loop formation of step S2 for the next wafer taking out.
[0021] On the other hand, the semi-conductor aligner 2 completes one wafer receipt even at step S16, and starts the processing for exposure.
[0022] First, the mask specified out of two or more masks beforehand held in equipment by the use mask name 40-2 in the information 40 on the processing conditions for the exposure of the wafer concerned which received at step S12 is set automatically (step S17).
[0023] Similarly, out of two or more exposure job files by which setting registration is carried out beforehand at the magnetic disk built in equipment, the parameter group of the exposure job file of the exposure job name specified by 40-3 is read, and a part for the exposure time specified by 40-4 next is exposed (step S18).
[0024] The wafer which completed exposure is taken out by the developer 5 which is back process equipment (step S19). All processings within the semi-conductor aligner 2 to one wafer received from the resist coater 1 above are completed, and it returns to step S11 that the following wafer should be received. By repeating the processing loop formation (from step S2 to S6 and from step S11 to S19) explained above, exposure processing is continuously performed to two or more wafers.
[0025] In addition, in the above-mentioned example, in the case of an electric communication link, the communication wire was explained, but you may be an optical communication link. Moreover, although the above-mentioned example explained by the case where processing conditions are switched from last process equipment (resist coater) to a semi-conductor aligner, you may be communicating the processing result of a semi-conductor aligner to a back process

processor (developer). Moreover, both before and after process equipment are unified, and you may become the approach a communication line also shares a single circuit.

[0026]

[Effect of the Invention] It becomes possible to switch processing conditions, without preparing a communication line independently by adding the information not only on the control signal of wafer transfer but processing conditions to the communication line for wafer transfer, as explained above.

[Translation done.]

TECHNICAL FIELD

[Industrial Application] About semiconductor fabrication machines and equipment, especially this invention is coupled directly with before and an after process processor, delivers and receives a wafer, and relates to the semiconductor fabrication machines and equipment which make processing automate.

[Translation done.]

PRIOR ART

[Description of the Prior Art] In the conventional semiconductor fabrication machines and equipment, when direct coupling (in-line) of an aligner, and before [the] and an after process processor (a resist coater and developer) was carried out and a wafer was delivered, only the control signal for an epilogue and wafer transfer was communicated by the communication line in between both equipment. Moreover, when automating the whole equipment, conditions (parameters, such as a mask and light exposure) required when processing that wafer had realized automation using the communication line prepared apart from the above-mentioned communication line by communicating with the host computer connected to this communication line, and obtaining data.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] It becomes possible to switch processing conditions, without preparing a communication line independently by adding the information not only on the control signal of wafer transfer but processing conditions to the communication line for wafer transfer, as explained above.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in the above-mentioned conventional example, since the communication line other than the communication line of wafer transfer was prepared and the information on processing conditions was acquired, there were the following faults.
[0004] (1) It must carry out easy [of the communication line for acquiring the information on processing conditions] independently. For this reason, wiring etc. becomes complicated and a wiring activity also becomes troublesome.
[0005] (2) Since the flow of a wafer (wafer transfer) and its processing condition information is another network (another communication link), management and control become complicated.
[0006] (3) When it is sheet processing (processing conditions differ for every one wafer), in order to communicate for every one wafer, the count of a communication link increases, effectiveness is bad and an equipment throughput falls.
[0007] This invention is made in view of the fault of the above-mentioned conventional technique, performs the communication link of wafer transfer, and the communication link of wafer processing condition data by the communication line of the same network between exposure process order processors, and aims at offer of the semiconductor fabrication machines and equipment which communication link effectiveness was raised and aimed at increase of an equipment throughput.

[Translation done.]

.OPERATION

[Means for Solving the Problem and its Function] Since said purpose is attained, according to this invention, the communication line for the wafer delivery between before and after process equipment enables the communication link not only of a wafer delivery control signal but the information on processing conditions at coincidence. It becomes possible to switch the processing conditions of a semi-conductor aligner, without this using independently the communication line for the data exchanges with a host computer etc.

[Translation done.]

EXAMPLE

[Example] Drawing 1 is the block diagram showing the example of automation Rhine which surrounds the semi-conductor aligner with which this invention is carried out.

[0010] In drawing 1 , 1 is a resist coater which applies a sensitization agent to a wafer as last process equipment of semi-conductor exposure, and 1a is the wafer taking-out section which takes out a wafer to a semi-conductor aligner. 2 is a semi-conductor aligner concerning this invention, and is imprinted on the wafer with which the pattern on a mask was applied to the resist. 2a is the wafer carrying-in section which carries in the wafer from the resist coater 1 in an aligner 2. 3 is the wafer conveyance device in which the wafer sent out from taking-out section 1a of the resist coater 1 is sent into carrying-in section 2a of the semi-conductor aligner 2.

[0011] 4 is the communication wire of specification, such as RS232C, and it sends the information on the processing conditions of the wafer into the semi-conductor aligner 2 at the same time it exchanges the control signal of the transfer between equipment of the wafer sent out to the wafer conveyance device 3. 2b is the wafer taking-out section which takes out the exposed wafer to a developer.

[0012] 5 is a developer as after [semi-conductor exposure] process equipment, and 5a is the wafer carrying-in section. 6 is the wafer conveyance device in which the wafer sent out from wafer taking-out section 2b of the semi-conductor aligner 2 is sent into wafer carrying-in section 5a of 5 of a developer. 7 is said communication wire 4 and the same communication wire. Here, this communication wire 7 also unites the information on the exposure result of a wafer, and communicates.

[0013] Especially drawing 2 shows the example of the contents of data concerning this invention. 40 is the contents of the information sent to the control signal and coincidence here, when a wafer is handed over by wafer carrying-in section 2a of the semi-conductor aligner 2 from wafer taking-out section 1a of the resist coater 1. This information directs the processing conditions over the semi-conductor aligner 2.

[0014] 40-1 is a discernment control code for making it identify that it is the information on the wafer processing condition at the same time it tells a semi-conductor aligner about having carried out conveyance initiation of the wafer. 40-2 is a use mask name used for exposing the handed-over wafer concerned, and is for two or more masks being beforehand held in the semi-conductor aligner, and carrying out selection directions from the inside of it. 40-4 is the exposure time for exposing the handed-over wafer concerned. 40-3 is an exposure job name which specifies the parameter file holding the parameter group of others which are used in order to expose the handed-over wafer concerned, and is for carrying out selection directions from two or more exposure job files by which setting registration is carried out beforehand at the magnetic disk built in the semi-conductor aligner.

[0015] Drawing 3 is the flow chart which showed the actuation between both sides in case a wafer is conveyed, and actuation of the subsequent semi-conductor aligner 2 to the semi-conductor aligner 2 from the resist coater 1.

[0016] Hereafter, actuation of this example is explained with reference to drawing 1 , drawing 2 , and drawing 3 .

[0017] The left-hand side (from step S1 to S6) of the flow chart of drawing 3 is a processing sequence by the side of the resist coater which is last process equipment. On the other hand, right-hand side (from step S10 to S19) is a processing sequence by the side of a semi-conductor aligner. While the processing sequence of these both takes a synchronization to each other and communicates to him, the sequence is carried out in parallel.

[0018] It waits for start actuation of the resist coater 1 which is last process equipment first (step S1). If start actuation is performed, the resist coater 1 will become the receiving waiting of the wafer carrying-in demand from the semi-conductor aligner 2 side (step S2). If start actuation is performed here from the waiting state (step S10) of start actuation of the semi-conductor aligner 2, a wafer carrying-in demand (I want to get a wafer) will be transmitted to the resist coater 1 (step S11).

[0019] The resist coater 1 which was waiting for this communication link escapes from the waiting loop formation of step S2, and progresses to the following step, the information 40 on the processing conditions for exposure of the wafer to be taken out from now on is transmitted to the semi-conductor aligner 2 (step S3), the wafer conveyance device 3 is operated after that, and wafer conveyance is made to start (step S4).

[0020] On the other hand, that the semi-conductor aligner 2 should escape from the loop formation (step S12) of waiting after step S11 by reception of the information 40 on the processing conditions for exposure of step S3, and the wafer currently conveyed should be received, actuation of wafer carrying-in section 2a is started (step S13), and a waiting loop formation until it carries out the completion of receipt is entered (step S14). If receipt is completed, it will escape from step S14 and actuation of wafer carrying-in section 2a will be stopped (step 15). Since receipt was completed, the completion of wafer carrying in (the completion of receipt) is transmitted to the resist coater 1 (step S16). The resist coater 1 which suited the condition (step S5) of the waiting for reception of this communication link

escapes from this step S5, stops actuation of the wafer conveyance device 3 (step S6), and, thereby, completes one wafer taking out. Then, it returns to the loop formation of step S2 for the next wafer taking out.

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[0023] Similarly, out of two or more exposure job files by which setting registration is carried out beforehand at the magnetic disk built in equipment, the parameter group of the exposure job file of the exposure job name specified by 40-3 is read, and a part for the exposure time specified by 40-4 next is exposed (step S18).

[0024] The wafer which completed exposure is taken out by the developer 5 which is back process equipment (step S19). All processings within the semi-conductor aligner 2 to one wafer received from the resist coater 1 above are completed, and it returns to step S11 that the following wafer should be received. By repeating the processing loop formation (from step S2 to S6 and from step S11 to S19) explained above, exposure processing is continuously performed to two or more wafers.

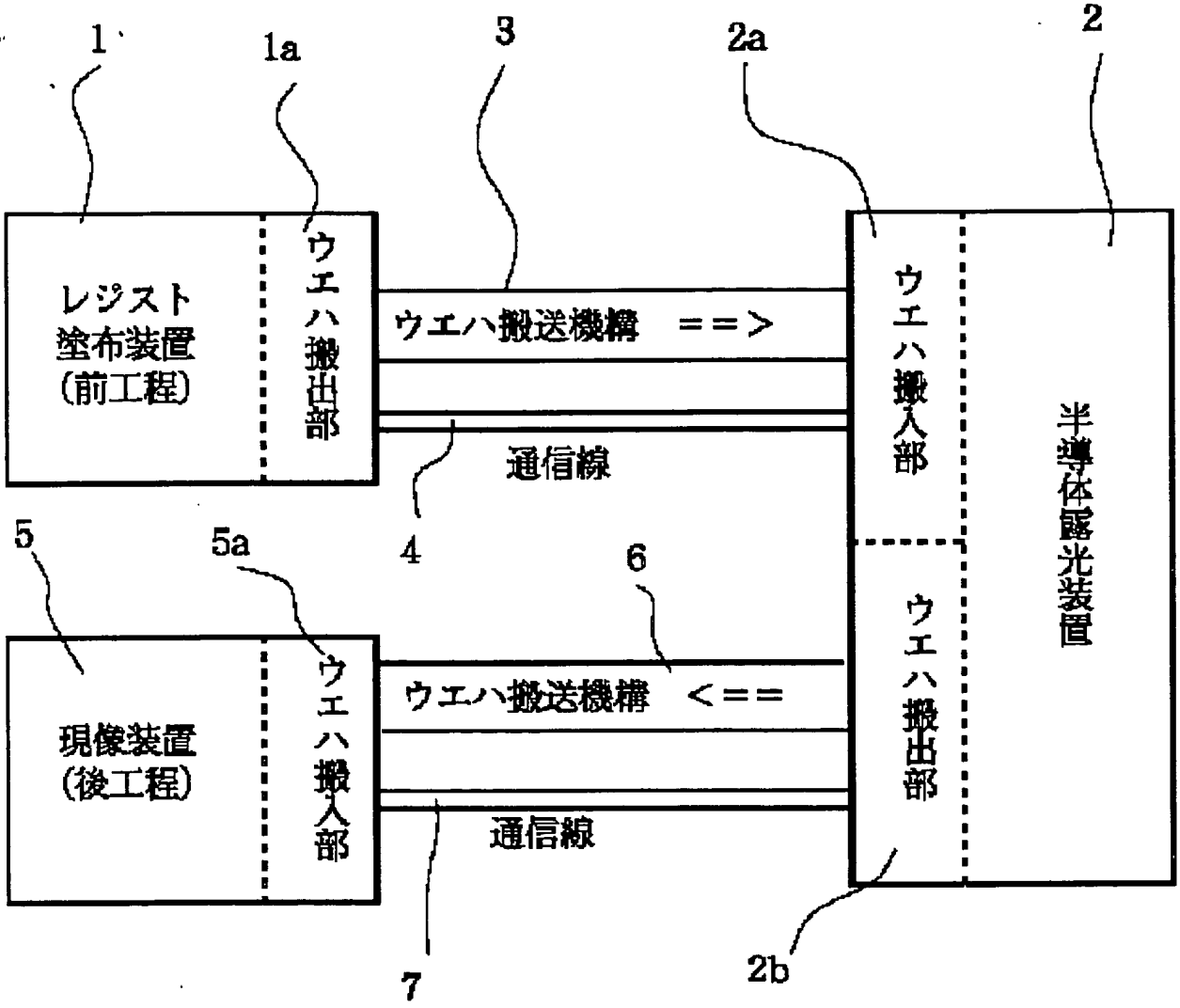
[0025] In addition, in the above-mentioned example, in the case of an electric communication link, the communication wire was explained, but you may be an optical communication link. Moreover, although the above-mentioned example explained by the case where processing conditions are switched from last process equipment (resist coater) to a semi-conductor aligner, you may be communicating the processing result of a semi-conductor aligner to a back process processor (developer). Moreover, both before and after process equipment are unified, and you may become the approach a communication line also shares a single circuit.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the example of automation Rhine which surrounds the semi-conductor aligner with which this invention is applied.
[Drawing 2] It is the example of the contents of data of the exposure conditions used with the semiconductor fabrication machines and equipment concerning this invention.
[Drawing 3] It is the flow chart which shows the actuation between both sides in case a wafer is conveyed, and actuation of a subsequent semi-conductor aligner to a semi-conductor aligner from a resist coater.
[Description of Notations]
The wafer taking-out section of 1; resist coater and a 1a; resist coater, 2; A semi-conductor aligner, The wafer carrying-in section of a 2a; semi-conductor aligner, 2b; The wafer taking-out section of a semi-conductor aligner, The wafer carrying-in section of 3; wafer conveyance device, 4; communication wire, 5; developer, and a 5a; developer, 6; wafer conveyance device, 7; communication wire, the contents of data of 40; exposure conditions, a 40-1; discernment control code, a 40-2; use mask name, a 40-3; exposure job name, 40-4; exposure time

[Translation done.]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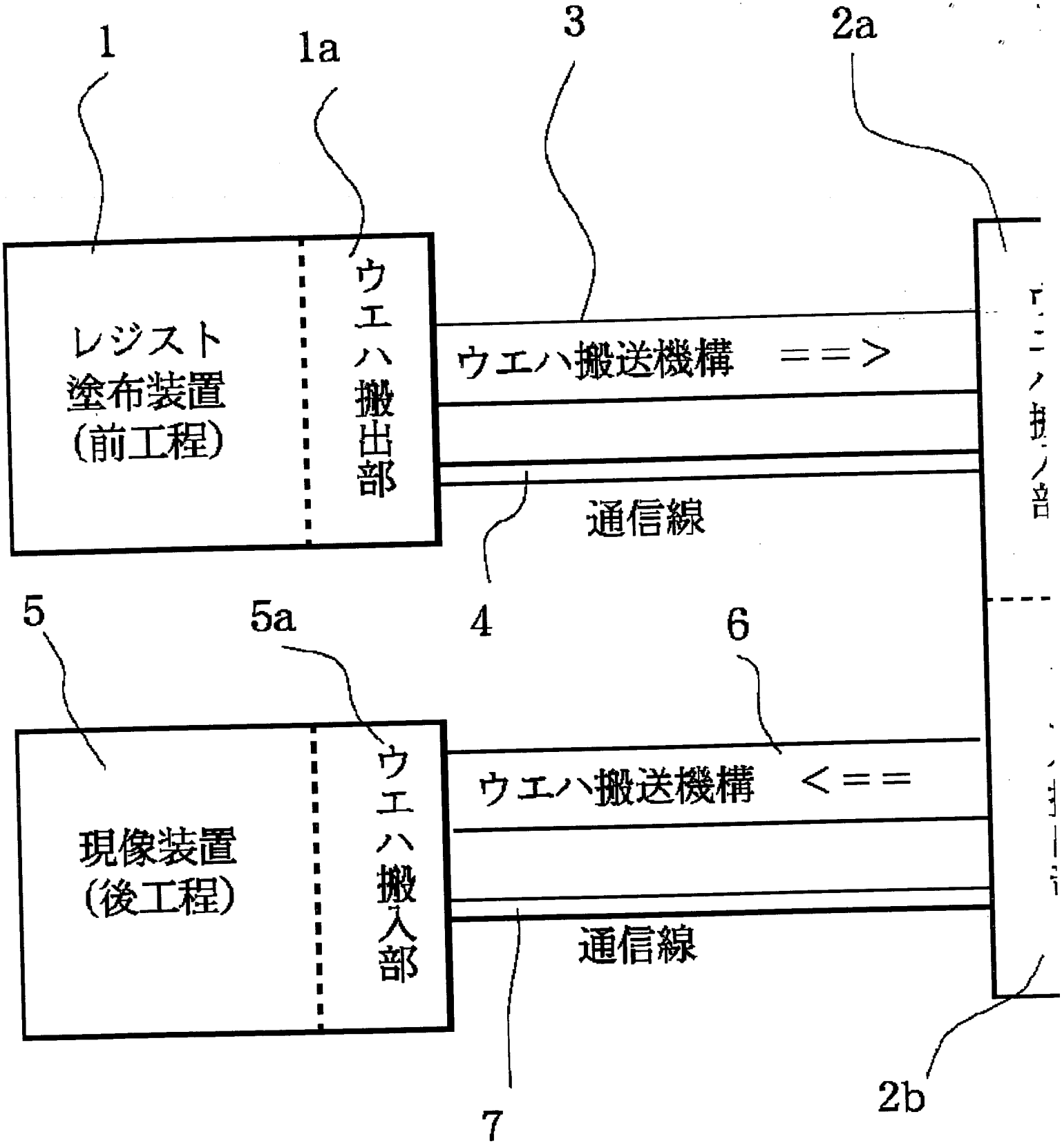
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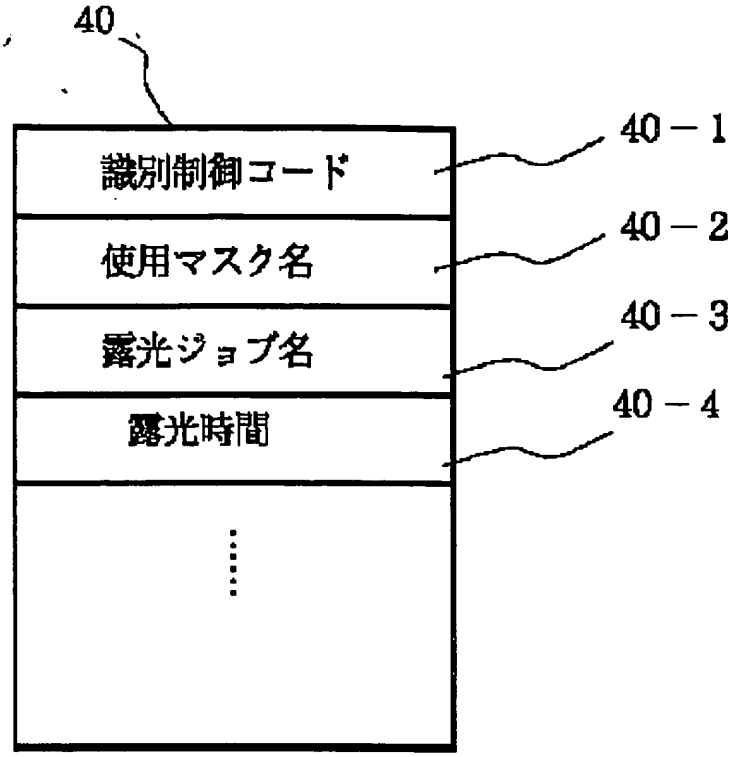
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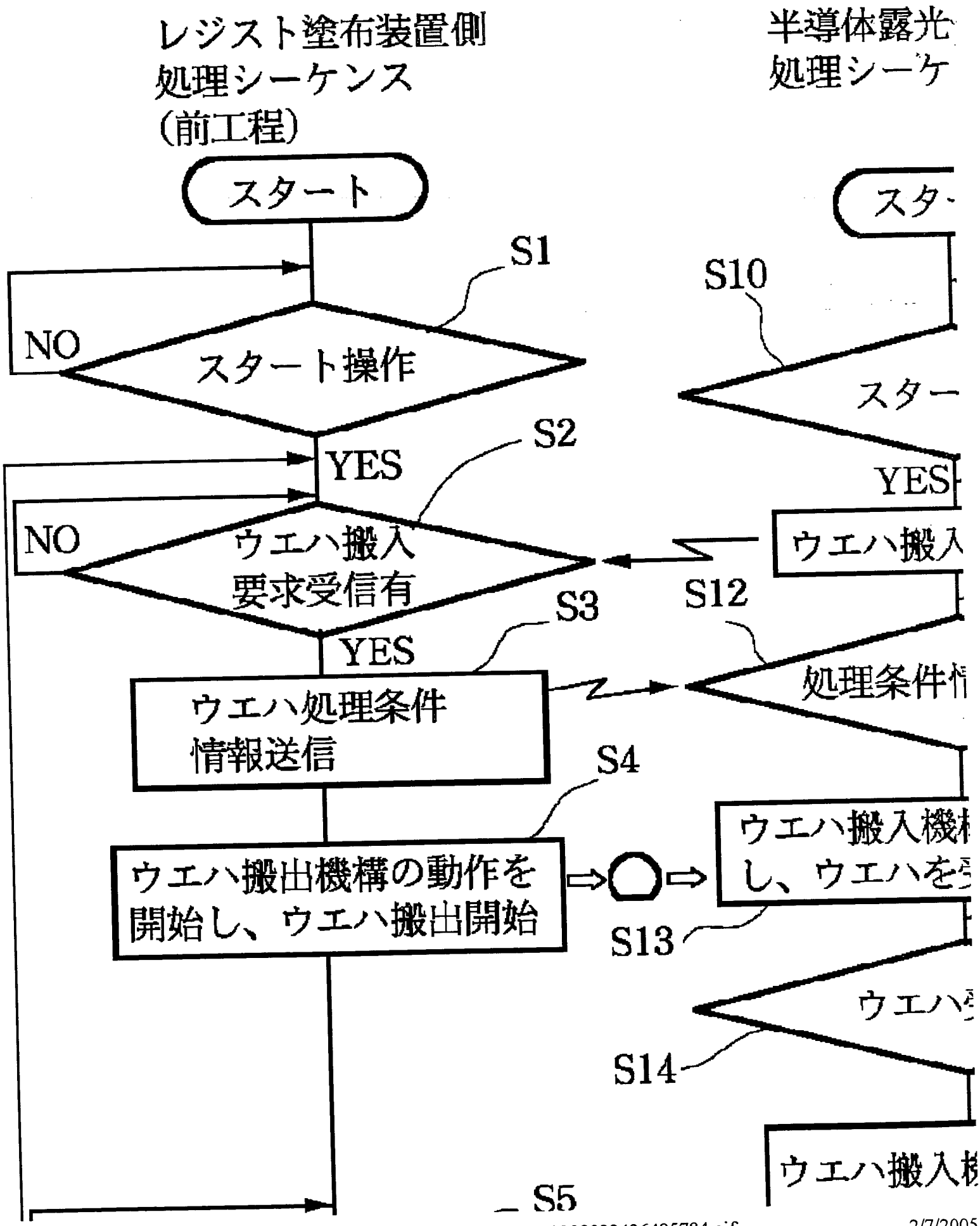
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